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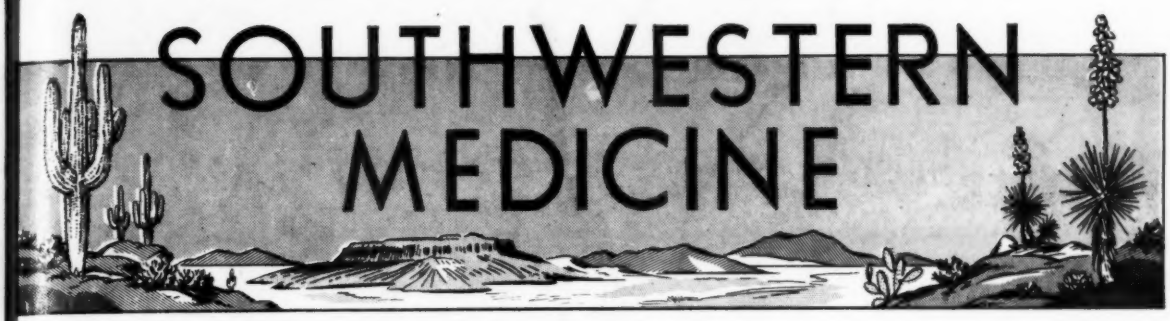

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THIRTY PIECES OF SILVER

There are certain physicians in this land of ours who have made no move on their own initiative to get into the service of the United States of America. Some of these men could qualify for duty with the armed services, others would be useful in civilian assignments. The point is that it befalls American Medicine to volunteer to a man for service of some sort in this total peril our country now is facing.

Lest this writer be adjudged a common scold, and alone in his playing of this tune, read the following from the *Journal* of the Medical Society of New Jersey:

Some doctors have been reluctant to enroll with the Procurement and Assignment Service. The blank was published in the January issue of this *Journal* and a form will be mailed to each physician later this month. By signing, a doctor indicates that he is available for service to the Government in his own branch of medicine or surgery. It was expected that practically 100 per cent of the physicians would respond to this call. Certainly it is hard to see how anyone can do otherwise.

At least one physician has said, however, that he felt under no obligation to sign the blank because he had received no individual request to do so. Its publication in a journal, he felt, was a hit-and-miss device which could not be meant to have any personal application to him.

Another doctor said: "Why should I stick my neck out?" adding that if and when the Government wanted him it would get him without his inviting himself to be selected.

Perhaps the wierdest objection was this one: "No other profession in the country is expected to offer itself en masse in this way, no other group is being asked to dislocate itself completely; why should doctors be the victims of discrimination?"

Discriminated against? Is the offering of your services to your country a discrimination or a privilege? Is it to medicine's discredit or to medicine's pride that it was the first profession to offer itself? What other group now has the opportunity of securing officer's status in the Army immediately on entering from civilian life? The answer is none. This privilege—that of entering directly into the status of an officer—is given to the medical profession and only to them.

If America loses this war, few of us will be able to practice honest medicine at all; and many will not want to survive the holocaust of a Fascist America. Of all who have a stake in democratic victory surely the intellectual, the scientist, the professional man has the largest. A physician who has to be coaxed into contributing his services to the winning of this war must indeed be troubled in conscience, narrow in vision, and mean in spirit.

WAR BONDS

This war must be paid for. Its daily cost is mounting, and will continue to do so until the victory. Those of us who must remain on the home front can be active in the battle with our dollars. For it will take dollars as well as men to beat the savage slave masters who made the error of attacking our America. Drives for the Red Cross, the U.S.O., the Navy Relief Society ask for donations. And gladly has the physician responded. But your government doesn't ask for donations, it asks the loan of your money and offers a sound rate of interest for the use of it. You'll be glad to invest in your America, won't you? Then, Buy War Bonds!

The *Journal Lancet* says:

In this world conflict in which we are fighting for the preservation of our nation, our ideals, and our way of life, physicians and surgeons are called upon for increased professional service. Not only is this true for our members serving the armed forces. Those of us who remain on the home fronts must assume additional responsibility for the care of private and clinic patients. At the same time, we must share the obligations of all civilian forces. One important duty for us as a united people is to provide the money for the greatest war program that America has ever put into effect.

Months before Pearl Harbor, the Treasury Department initiated the Defense Savings Program. Through this, the Government sought to secure loans directly from the people to help finance our Defense Program. Now the nation is engaged in total war. We can and we must pay all of our resources into this national war effort. This means not only the service of our people and the material goods of the nation, but all our financial resources, as well. And we as individuals must carry our share of the responsibility.

We do provide a part of the money in tax payments. But a large portion of the total, we must invest voluntarily through the purchase of war securities—*United States Savings Bonds and Stamps*. These loans to the Government may be made in sums as small as 10 cents and as large as $10,000. Regardless of the denomination of our purchases, it is our obligation to buy and continue to buy to the maximum of our ability.

By investing our money in United States Bonds, we as individuals, help in the war effort; we assist in the nation's fight to curb inflation by putting our money into war securities rather than every-day goods; and at the same time, we build our own personal security.

Arizona Medicine in 1900 and Today

E. PAYNE PALMER, M. D.
Phoenix, Arizona

PREAMBLE

I AM highly appreciative of the honor you have bestowed upon me. I fail to find words to express my deep feeling. To have practiced medicine in Arizona since the beginning of the century, to have known practically all of its medical profession and many of its most prominent lay citizens who have resided here during the past forty-two years is to have enjoyed a privileged life. And, finally, to be given the highest honor that the medical profession of this state can bestow, fills me with a happiness which passeth all understanding.

We owe a deep debt of gratitude to the pioneer physicians of Arizona. They made possible the medical profession as we have it today. Prior to 1900, even in the best medical schools, training was insufficient; students memorized lectures from notes; there was little clinical instruction, no experimental training; even equipment was meager. Here in Arizona, physicians lacked hospital facilities. Many of the pioneer physicians were located in remote places; they were unable to obtain assistants or consultants when needed. Those were the horse and buggy days, days with only paths, or at best, poor roads to travel over. In town, many a physician made use of a bicycle for short distance and night calls, finding it less troublesome than hitching up his horse.

The Arizona pioneer physician was a person of indomitable courage, striving to do his duty to his patient and to uplift the medical profession. This was the type I found upon my arrival April 1, 1900. They were friendly, but they were strong competitors. I was told that medical ethics prevailed in Arizona and must be observed.

In 1900 Governor N. O. Murphy reported to the Secretary of Interior of the United States the appointment of the following Board of Medical Examiners: Dr. Winfred Wylie (Regular School) Phoenix, Dr. D. M. Purman (Regular School) Phoenix, Dr. George Goodfellow (Regular School) Tucson, Dr. W. L. Woodruff (Homeopathic School) Phoenix, and Dr. C. W. Woods (Eclectic School) Jerome. As you will note, one member of the board was a homeopath and another an eclectic. There were at this time a considerable number of homeopaths and

President's Address, at the Fifty-first Annual Meeting of the Arizona State Medical Association, held at Prescott, Arizona, May 25-29, 1942.

a few eclectics in Arizona. The regular school, of course, did not consider the other two schools of medicine worthy of recognition. By way of comparison, and with no intent of belittling any of the schools, the homeopath of that time was on a par with the osteopath of today; eclectic was on only a slightly higher plane than the chiropractor as we know him today.

On May 7, 1892, Dr. J. Miller, President of the Maricopa County Medical Association, addressed a letter to the physicians of Arizona. "It is evident that there are many earnest and jealous physicians in Arizona who are willing to contribute their time and talent towards the general interest of the medical profession. The greatest good to the profession can be accomplished through organization, therefore, be advised that a meeting of the physicians of the Territory of Arizona will be held in Phoenix, on May 25th, (Wednesday) in order that we may elect delegates to the American Medical Association which meets in Detroit June 7, 1892."

In response to the call Doctors M. M. Gilbert, Mesa; Mauck, Tempe; I. B. Hamilton, Tombstone; Thomas H. Sabine, Gila Bend; H. A. Hughes, L. D. Dameron, Neil McIntyre, W H. Ward, and Ancil Martin, all of Phoenix, M. W. Brack of Tempe; and J. W. Green of Tucson, assembled in the parlors of the Commercial Hotel.

The meeting was called to order by Dr. J. Miller. A prayer was offered by the Reverend George Pearson, Phoenix, and an enthusiastic and encouraging address of welcome was extended by Governor Murphy. A temporary organiation was first formed with Dr. J. Miller as chairman and Dr. Ancil Martin as secretary. Two committees were named. One on a constitution consisting of Doctors Hughes, Green, and Gilbert, and another on nominations consisting of Doctors Dameron, Hamilton, and Ward. After a recess the committees reported. With but few corrections the report of the constitutional committee was adopted, and they were discharged. The report of the nomination committee was as follows: President, Drs. Hughes and Miller; first vice-president, Dr. Hamilton; secretary, Dr. Green; treasurer, Dr. Sullivan. Dr. Miller was elected president by ballot and other nominees by acclamation; the meeting then adjourned until 10 A. M. May 26th.

The association meeting was called to order at 10:30 A. M. May 26th by President Miller. A Judicial Council as far as was possible consisting of one member from each county was appointed: Pima — Dr. Fenner; Yavapai — Dr. Pope; Yuma—Dr. Cotter; Cochise—Dr. Porter; Gila—Dr. Collins; Pinal—Dr. Sabine; Coconino —Dr. Cornish; and Maricopa—Dr. Hughes. A committee consisting of Drs. Dameron, Brack, and Martin was appointed to arrange for the next meeting; as well as a committee on publication, Drs. Green, Hamilton and Dameron, who were authorized to publish the constitution and By-Laws, in full, and an account of the meeting. Resolutions of thanks were extended to all participants. The meeting then adjourned. Following adjournment a banquet at the Commercial Hotel was given by the Maricopa Society. Members of the newly formed association and their wives, as well as many representative citizens, were present for an enjoyable evening. The social program of the first meeting of the Arizona Medical Association was a decided success.

The records show that each annual meeting was equally successful, considerable time being spent on legislative matters in an effort to improve the laws relating to the practice of medicine. Membership increased; excellent papers were presented. At a meeting held in Tucson May 17, 18, 1898, the Judicial Council recommended the following resolution: "Resolved, that it is the sense of this Association that it is a breach of the code of medical ethics of the American Medical Association for members of this Association to consult with homeopaths, under any circumstances." The resolution was passed.

1900

A factional fight which had been carried on for several years between the Hughes and Wylie followers reached its climax in 1990. Many members of the Arizona Medical Association, tired of this disturbing element at the annual meetings of the association, felt that they did not care to attend a meeting where a display of hatred was so noticeable.

The ninth annual session of the Arizona Medical Association convened in Prescott May 29, 1900. The meeting was called to order by President Win Wylie, in the office of Dr. T. B. Davis. In the absence of Secretary Otto E. Plath, Chas. H. Jones was appointed secretary pro tem. There not being a quorum present, the meeting was adjourned until the Judicial Coun-

cil could pass upon applications on file in order to admit several applicants present for participating in the proceedings.

The afternoon session was called to order by President Win Wylie; the Judicial report was received and accepted. The secretary was instructed to cast a ballot for all of the thirteen applicants. Dr. William Duffield read a paper on "Status of Our Medical Law". Dr. John W. Foss presented a paper on "Tuberculosis". Dr. Win Wylie gave a very able presidential address, and Dr. Charles H. Jones presented a paper on "Thermic Fever". The annual election of officers was carried on which resulted as follows: President, Dr. T. B. Davis, Prescott; first vice-president, Dr. John Dennett, Jr., Congress; second vice-president, Dr. A. E. Ealy, Kingman; third vice-president, Dr. Wm. Duffield, Phoenix; secretary, Dr. Charles H. Jones, Tempe; treasurer, Dr. H. W. Fenner, Tucson; essayist, Dr. Ancil Martin, Phoenix. On motion it was decided to hold the next meeting in Phoenix in May, 1901, at a date to be set by the president and secretary. An invitation was received from the citizens of Prescott to a reception and ball in the Elks' Hall in the evening, which the Association accepted. The session then adjourned. A very pleasant time was enjoyed at the Elk's Hall by all who attended, and so ended the Prescott meeting.

In 1900 Dr. J. Miller was superintendent of the Arizona Territory Insane Asylum at Phoenix, and Dr. L. N. Moller was prison physician for the Arizona Territory Prison at Yuma. At that time there was no Arizona Territory Board of Health. Under an act approved by the legislature and signed by the governor March 19, 1903, one was created April 22, 1903. Its chief function was to register births and deaths, and to control communicable diseases. Dr. R. M. Dodsworth was the first Superintendent of Health. He received $1,000.00 a year salary and $300.00 for clerical hire, office supplies, and incidental expenses. At this time there was also an act which did not permit physicians and surgeons of the territory to examine civil or criminal cases without the patient's consent.

During the summer of 1900 there was considerable discussion among Phoenix physicians as to the advisability of organizing another medical society in order to get away from professional discord. On September 1st, Drs. Ancil Martin, D. M. Purman, W. H. Ward, John W. Foss, Otto E. Plath, and E. Payne Palmer, met at the office of Dr. Foss. After considerable discussion, the Arizona Academy of Medicine was organized, with the following elected to office: Dr. Ancil Martin, President; Dr. Otto E. Plath, Vice-president; Dr. John Foss, treasurer; Dr. E. Payne Palmer, secretary. It was decided that the meetings would be held quarterly, at 8 p. m. on the first Monday of October, January, April and July, the first regular meeting to be held in Phoenix. None of the physicians involved in the factional dispute were invited to join this organization. The meetings were well attended, however, and the programs were good. The organization was a continuing success, with the membership increasing. The Maricopa County Medical Association was re-organized in 1911, and the members of the Academy of Medicine voted to discontinue the meetings so as not to interfere with the activities of the county society. Thus ended the Arizona Academy of Medicine.

St. Joseph's Hospital in Phoenix in those early days could accommodate twelve patients; even then it was not always filled. The majority of the cases were medical, for there was no operating room. When an operation had to be performed, the linens were boiled in a clothes boiler and used at the operation while still wet. Two carpenter horses would be placed in the patient's room, to support a specially constructed board cover which completed the improvised operating table. The patient was then placed upon this table, and the parts to be operated upon were thoroughly washed with soap and warm water.

The surgeon invariably prepared himself for the operation by removing his coat, rolling his sleeves above the elbow, and putting on a non-sterilized rubber apron. The purpose of the apron was to protect his clothing. His hands and forearms were also washed with soap and warm water. Caps, masks, gowns, and gloves were gadgets not yet thought of for surgery. Chloroform was the anesthetic of choice; ether was given by the cone method and wrought terror upon the patient. Several persons were usually required to hold the patient on the table during the preliminary stage of anesthesia.

Operations, however, usually proceeded satisfactorily. Silk sutures were used, and few infections resulted. Wounds almost always healed by first intention; there was only an occasional

postoperative hernia. Stomach lavage, transfusions, hypodermoclysis, proctoclysis, intravenous fluids,—none of the pre- or post-operative methods in use today—were known then. Water was withheld for two or three days after operation. Rarely was a narcotic given to relieve pain. With meager equipment surprisingly satisfactory results were obtained. As I review the situation today, the pioneer surgeons and their patients assume heroic stature.

The injured workman was usually a private patient who relied upon his employer to compensate him for loss of time, suffering and disability. Though some of the cases were settled satisfactorily, the majority were taken into court before settlement was effected. When these became court cases, the physician waited for his fee until settlement could be obtained; frequently the workman received his compensation, the attorney his fee, and the doctor, who had borne the burden of restoring the workman to health, continued to wait. Of course, if the case was lost by the workman, the physician was lost along with him.

TODAY

We are in an all out war; so the first duty of the doctor of medicine in Arizona is to his country, even though it means the "Supreme sacrifice". The doctors of medicine in this state are making their contribution to national defense and to the safeguarding of national integrity and ideals. Without prospect or even thought of reward, they are contributing their services to the fullest extent. Doctors of medicine are accepted and called into the army and navy to serve in their professional capacity; without them the armed forces could neither organize nor operate. Those of our members who remain at home must give all aid to civilian defense as well as other war activities. There is much that you can do to aid; give freely your professional services; give freely financial aid; buy war bonds—they are a good investment.

Each member of our association should appoint himself a committee of one to get new members. We need the prospective members, but even more, they need what our association has to give to them. Doctors living in Arizona, who are eligible to membership in our association and who do not embrace the privilege, are losing a life's treasure which can only be appreciated by the members who are regular attendants at our annual meetings.

Good will among our members must be cherished as one of our greatest assets. Good will is largely a matter of personal attitude. Consequently every member of our association has an individual responsibility. He must refrain from doing and saying things that will give offense to a medical confrere. No physician should consider himself independent of his professional neighbors. As was stated by Dr. J. Miller in 1892, "The greatest good to the medical profession can be accomplished through organization." Our neighbor's problems are the same as our own; it is only by co-operation and good will that he can enjoy his work and be able to carry it on to the best advantage to his patients and himself. The satisfaction of good will among one's professional neighbors is a thing worth working for. There is a great difference between meeting a physician with whom you are friendly and one towards whom you hold a grudge.

Members of this association have real work ahead. I expect full co-operation from every member. Individually, and as a group, we must explain to the laity that good health, that is, a sound mind within a healthy body, is their most important earthly asset. The medical profession is the only group qualified through education and experience to direct and actively carry out the problems pertaining to public health. We must see that the citizens of Arizona have laws protecting their health, permitting them to have the best medical service possible; that the Superintendent of Public Health be appointed subject to our approval; that patients confined in state institutions have proper medical service; and that members of the Board of Medical Examiners shall likewise be appointed only after approval of our association. Only in this way can we maintain a high standard of medicine in Arizona. Someone must advise the legislators and the governor of such matters, and doctors of medicine are the only persons qualified to pass upon such problems correctly.

The Public Health Code as enacted by the last regular session of the legislature is adequate; it is being administered by an experienced and thoroughly qualified Superintendent of Public Health, who is a respected member of our association. We should aid him in every way possible that the health of the citizens of our state may be improved.

The Arizona Industrial Commission co-operates with our association through the Industrial

Relations Committee. They hold a joint meeting once a month to discuss problems that arise between the physicians and the Commission as a result of the treatment of industrial cases. Through combined effort these meetings clear up the problems involved. The recently adopted fee schedule was drawn up by the Industrial Relations Committee, with some minor changes made by the Commission with the approval of the Committee. It is felt that this fee schedule is one of the best operating in the United States. Because of the co-operation which our association has received from the Commission, we have a very friendly feeling toward them.

House Bill No. 178, adopted by the last regular session of the legislature and signed by our governor, created a law which gave osteopaths "equal rights and privileges with physicians and surgeons of other schools of medicine relative to the treatment of cases and the holding of public office or position, and their reports shall be accepted by the officers of the department of which the same are made, with like force and effect." By the enactment of this measure the licensing standard for the practice of medicine was materially lowered, placing the health of the people of Arizona and the future welfare of the state in jeopardy.

After much effort and at a great cost a fairly satisfactory amendment relating to osteopathy was enacted by the last session of the legislature. The practice of osteopathy as defined is limited to that system of treatment as taught and practiced in the standard colleges of osteopathy recognized by the American Osteopathic Association; the college of osteopathy is also defined: major surgery is limited to those having "at least two years of surgical internship in a hospital or hospitals approved either by the American Osteopathic Association, or by the American Medical Association; and then such practice of major surgery shall be only in osteopathically owned or controlled hospitals or institutions."

Human nature cannot be changed by legislation; neither can qualification as a DOCTOR OF MEDICINE be acquired by legislative activity; not even when it has been voted at a late last-hour night session. It is the trained and qualified DOCTOR of MEDICINE who determines success in the proper care of the ill and injured. Only trained DOCTORS of MEDICINE are qualified to direct and administer public health measures. Arizona's fourteen approved hospitals can continue to hold their honored position, only if we can maintain high standards of medicine in Arizona. DOCTORS of MEDICINE, who have courage and are willing to use persuasion, can easily educate the intelligent people of Arizona to understand the importance of maintaining the high standards of medicine within our state. Thousands of people come to Arizona each year at the suggestion of their physician. We must not let it be said that the standards of medicine in Arizona, as set by our legislators, are too low to be recognized by physicians in other states. Remember, you have in your brain the most wonderful store of knowledge which God and man ever created. For heaven's sake, use your influence with the people of your community to keep the standards of medicine high so the citizens of Arizona can continue to have that high type of medical service which they are entitled to receive. Talk with your legislator; show him where he was wrong, dead wrong. Convince him even against his will, if necessary. Get others to talk or write to him. Legislators, and even the governor, will heed the appeal of a majority of the voters. We must make them realize that only after a long period of schooling and practical application are DOCTORS of MEDICINE qualified to practice.

Let us recapture the enthusiasm of the pioneer physician. He constantly strove to better the medical profession, to secure the passage of laws regulating its practice. Many of our members have never attended the annual meetings; others appointed to serve on committees accept graciously, but fail to attend meetings to serve the association. During the past year the members of the Scientific Assembly did not serve well; the majority showed no special interest in the work of the committee and did not attend the meetings regularly. The April meeting was cancelled because a quorum was lacking. Each committee has a definite purpose and should function properly. Therefore, in the future, all members who accept appointments on committees must be willing to serve when called upon to do so. Since the association is doing all it can to aid its members, so the individual member must be willing to give something in return for what he has received.

It is high time for the medical profession to develop leadership in medical matters, not only of the state, but also of the nation. Upon our shoulders rests the responsibility for maintaining one of the nation's greatest institutions—free and independent medicine—an institution upon which the American people have every right to rely for the protection of their health and the prolongation of their lives. Each member of this association must be a leader and a teacher in his community. He must take the time to explain to his patients and citizen group the importance of the DOCTOR of MEDICINE in relation to public health and the extension of the best medical service possible to all citizens. At times, it is difficult to make the public understand that the doctor can plead the cause of scientific, ethical medicine for other than his own self-interest; yet, it must be done in Arizona in order to maintain standard public health measures and to prevent unqualified persons attempting to practice medicine. And it can be done.

If I have spoken strongly, it is only because I feel strongly upon this subject. Forty-two years of practice, first within the Territory, and then within the State of Arizona, have taught me this if nothing more; life becomes worthwhile through doing, not getting. The reward of my forty-two years lies not in fees for professional services rendered, but in the memory of whatever slight part I have played in helping shape for the better the field of medicine and surgery within this state.

Within his own memory does man find success or failure in life. Some of you younger men may smile at such philosophical mysticism. But wait until you have practiced for nearly a half century; and if you do not feel the same, then I—wherever I may be—shall feel sorry for you.

Professional Bldg.

Conservative Surgical Treatment of Peptic Ulcer

HAROLD LINCOLN THOMPSON, M. D.
Los Angeles, California

In August, 1881, Wolffler performed the first successful operation on the human stomach. In the fifty-eight years of its history, gastric surgery has long since passed the stage wherein it was resorted to only as a palliative or life-saving measure. Its usefulness has been extended so that at the present time it is utilized not only in the eradication of malignancy but also in the treatment of benign and uncomplicated disease of the digestive tract. In fact, the field has become so broad that in an hour devoted to its discussion one can only hope to treat the subject superficially. I shall, therefore, endeavor to avoid controversial points and confine my discussion to conservative views which today are held in favor in this country.

This discussion will be divided into three parts, first, a clinical classification of surgical peptic ulcer; second, an outline of the indications for operation and third, a discussion of appropriate treatment of each type of ulcer mentioned in the classification.

CLINICAL CLASSIFICATION

At the outset let us consider a clinical classification of surgical peptic ulcer. First, there are the acute inflammations of the stomach and duodenum, namely, gastritis, duodenitis and acute peptic ulcer. Recently European Clinicians have recalled to our attention acute localized inflammation of the gastric mucosa, while in America certain writers have described a similar condition of the mucous membrane of the duodenum. Occasionally one of these lesions is the only finding at operation performed for the relief of typical ulcer distress, in patients with characteristic roentgenologic signs of ulcer and, usually, evidence of some complication, particularly hemorrhage from the gastro-intestinal tract. It is believed by some pathologists that this type of inflammation is the fore-runner of actual ulceration and is the condition which often progresses to typical chronic ulcer of the stomach or duodenum. Acute non-calloused peptic ulcer frequently is seen at operation or autopsy following the complication of acute perforation or hemorrhage.

In chronic simple, or uncomplicated, peptic ulcer the problem of determining appropriate treatment is chiefly a question of location of the ulcer. The decision as to whether medical or

(Presented before New Mexico Medical Society, at Gallup, N. M., May 11-13, 1939.

surgical treatment should be applied rests in part on the determination by x-ray before treatment, whether the ulcer is located in the stomach or in the duodenum.

A second factor, namely, situation of the ulcer is one which usually cannot be ascertained prior to operation. It is, however, of the greatest importance in selection of the operation most suitable in a given case. If the ulcer is in the stomach the operation selected depends upon whether it is situated on the anterior wall, the posterior wall or near the cardia. If it is duodenal, the choice of operation depends on whether it is on the anterior or the posterior wall of the duodenum.

The treatment of the complications of peptic ulcer naturally varies with the type of complication. Those common to ulcer both of the stomach and duodenum, are obstruction; hemorrhage, of which there are clinically acute and recurrent types; and perforation, of which clinically there are acute, subacute and chronic perforating varieties. Complications characteristic of ulcer of the stomach, and uncommon to or absent in the duodenum, are hour-glass deformity and malignant degeneration.

The treatment of recurrent peptic ulcer depends on whether it follows gastro-jejunostomy or partial gastrectomy and in addition whether or not it is complicated by hemorrhage or perforation.

Some form of clinical classification of surgical peptic ulcer is of great aid in the treatment of this disease, the varied features of which often are puzzling to the surgeon.

INDICATIONS FOR OPERATION

The sixteen procedures (Fig. I.) used in the conservative surgical treatment of peptic ulcer may be said to be the armamentarium of the gastric surgeon. I should like to sound a note of caution at this point against the rigid adherence at operation to a surgical procedure planned before operation on the basis of clinical and roentgenologic manifestations. With respect to the choice of procedure, the surgeon should maintain an open mind until he has had the opportunity to explore the abdomen. He should be guided in this choice by the results of this direct examination of the lesion.

Every case of peptic ulcer presents two problems. The first problem to be solved is the choice between medical and surgical treatment. If surgical treatment is determined upon the second problem is to select the appropriate operation.

The first consideration in the choice between medical and surgical treatment embraces personal factors on the part of the patient. These factors include intelligence, cooperation and economic status. I think it safely may be said that surgical treatment is preferable if the patient has not the intelligence, inclination to cooperate or economic means to pursue a prolonged period of medical treatment. Other things being equal, I believe that uncomplicated cases of peptic ulcer should have a trial at medical treatment before surgery is advised.

A second consideration of the utmost importance in the choice between medical and surgical treatment is the anatomic location of the ulcer as determined by roentgenologic examination. Many, or perhaps most cases of uncomplicated duodenal ulcer not only may be but probably should be treated by medical means because the occurance of carcinoma of the duodenum is rare. This unqualified statement does not apply, however, to gastric ulcer because of the greater possibility of the existence of malignancy in ulcer situated in the stomach. It has been demonstrated repeatedly that the large ulcers of the stomach are commonly malignant and that whereas the frequency of malignant degeneration is less common in small ulcers, the physician cannot be certain that malignant cells are absent without the benefit of competent opinion based on microscopic examination of the tissue. While a trial at medical treatment under close clinical and roentgenologic observation is justifiable, in patients with large gastric ulcers wherein prompt definite response is not noted, the benefit of surgical exploration should not be delayed.

The third important consideration in the choice between medical and surgical treatment refers to the severity and the duration of the symptoms and to the clinical course of progress of the disease. Duodenal ulcers which occasionally produce acute, mild or merely annoying symptoms may be treated medically with marked benefit. On the other hand, simple or uncomplicated duodenal ulcers which produce chronically recurring, severe or frequently disabling symptoms usually require surgery for relief. The chronicity characteristic of peptic ulcer is one of its greatest problems so that once a victim the patient is potentially a victim of

ulcer for life. Thus delay in the application of surgical treatment may afford opportunity for the development of complications or features which make operation more difficult or the benefits of surgery less certain.

The second problem, relative to the choice of operation in surgical peptic ulcer, is the more difficult because usually it requires decision at the operating table. The choice should be based on three points: first, the age and general condition of the patient; second, the anatomic location of the ulcer, and third, the pathology encountered. In general a youthful patient will tolerate radical surgery quite well. Unfortunately, however, the aged victim of peptic ulcer often has permitted the disease to progress to the point where more radical procedures are required. In the latter group, extensive surgery such as partial gastrectomy can be divided, if desired, into two or more stages with advantage to the patient.

I already have pointed out that the anatomic location is a determining factor in the choice between conservative and radical treatment. For the reason that gastric ulcers, being actually or potentially malignant, more frequently require surgical treatment so also do they call for complete surgical removal whenever this is possible.

In duodenal ulcer, on the other hand, the safe disregard of the question of malignancy, which, as I have said, permits the application of conservative medical management, likewise allows the utilization of conservative surgical procedures in the treatment of surgical duodenal ulcer.

In the selection of the type of operation applicable to a given case of surgical peptic ulcer, a factor as important as any other is the type and extent of the pathology encountered on exploration of the abdomen. Thus, the surgical procedure may vary with the acuteness or chronicity of the ulcer as determined by the degree of induration or callus formation found to be present. Likewise it varies according to the presence or absence of the complications characteristic of peptic ulcer, namely, hemorrhage, perforation, obstruction, hour-glass deformity or evidence of malignant degeneration.

CONSERVATIVE SURGICAL TREATMENT OF PEPTIC ULCER

We shall now turn from this general discussion to a consideration of the selection of appropriate types of operation for the different varieties of peptic ulcer.

In conservative surgical treatment of gastric ulcer, the selection of operation depends on two factors, namely, the size of the ulcer and the situation of the ulcer. In gastric ulcer with a diameter of less than 2.5 cm. knife or cautery excision (Fig. I, G, H) is permissable provided the services of a competent pathologist are available for immediate microscopic examination of a frozen section cut from the ulcer after its removal. After closure of the opening made by removing the ulcer, it usually is desirable to provide permanent drainage from the stomach preferably by performing posterior gastro-jejunostomy (Fig. I, M). In general, gastric ulcers which exceed a diameter of 2.5 cm., because of their actual or potential malignancy, should be removed by partial gastrectomy with the re-establishment of gastro-intestinal continuity by the Polya or Billroth II method. (Fig. I, N, O.)

We shall refer now to the selection of operation based on situation of the ulcer. In small

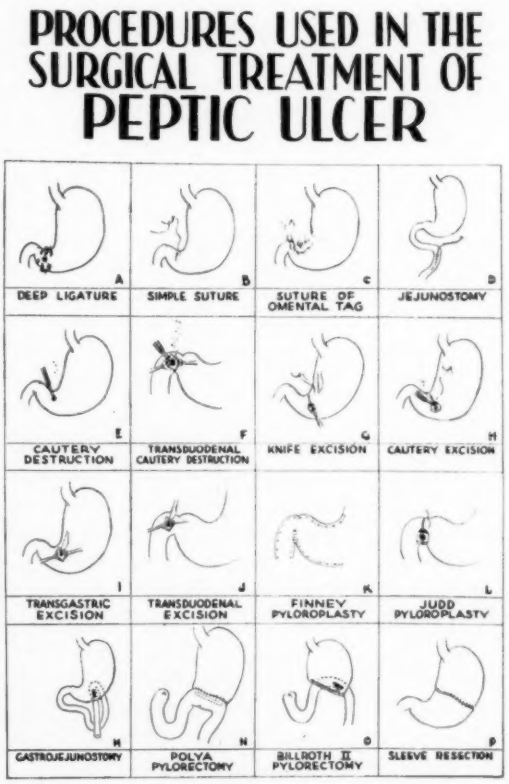

Figure I

gastric ulcer situated on the anterior wall, lesser or greater curvatures of the stomach knife or cautery excision (Fig. I, G, H) may be employed after benignity of the lesion has been determined by the pathologist. Ulcers of small size situated on the posterior wall of the stomach may require transgastric excision (Fig. I, I) with gastrojejunostomy. Uleers situated at or adjacent to the cardia should be excised if possible. If by virtue of their location they are difficult or impossible to remove, they should be treated by complete physiologic rest to the stomach with feeding of the patient through a jejunostomy tube (Fig. I, D) until roentgenologic followup examination discloses definite improvement.

In the surgical treatment of duodenal ulcer, because the occurance of malignancy in the duodenum is rare, the selection of operation depends on only one factor, namely, the situation of the ulcer. Duodenal ulcers situated on the borders and anterior wall should be excised with the knife or cautery, the opening being closed in the form of the Judd or Finney pyloroplasty (Fig. I, K, L) provided the duodenum is sufficiently mobile to permit of these procedures. Otherwise destruction of the ulcer by cautery puncture, suture of the puncture wound and the performance of posterior gastrojejunostomy (Fig.I, M) is the only alternative. Ulcers situated on the posterior wall of the duodenum should be destroyed with the actual cautery through a transduodenal approach (Fig. I, F) and the latter opening closed transversely to the axis of the intestine in the form of a pyloroplasty.

The next consideration of peptic ulcer will be from the standpoint of pathology with special reference to whether the ulcer is simple or complicated. The acute uncomplicated duodenal ulcers and the so-called cases of duodenitis usually are encountered on exploratory incision of the duodenum in patients who have experienced symptoms or complications of considerable severity. The most conservative procedure in these mild pathologic changes is to excise the lesion and close the longitudinal incision transversely to the axis of the duodenum, a procedure which unquestionably relieves a large proportion of these cases.

The complications common to acute and chronic peptic ulcer, namely, hemorrhage and perforation demand special consideration. As patients seldom die from the initial hemorrhage from gastric or duodenal ulcer, the preferred treatment may be either the conservative medical treatment consisting of rest in bed under morphine, ice to the abdomen, fluids under the skin, and by rectal drip followed by diet similar to that devised by Sippy and transfusion of blood if required; or according to the principles outlined by Meulengracht wherein the patient is kept under close observation with full feeding, alkali powders and transfusion if necessary. When hemorrhage tends to recur, cautery excision (Fig. I, H) or destruction (Fig. I, E) of the ulcer is indicated supplemented by pyloroplasty in duodenal ulcer and gastrojejunostomy in gastric ulcer as the case may be. In gastric ulcer the procedure of second choice is pylorectomy (Fig. I, N, O) otherwise ligation of the adjacent vessels by deeply placed ligatures. (Fig. I, A.)

The requirements in perforation of peptic ulcer vary with the acute, subacute or chronic perforating types of this complication. Acute perforation demands closure at the earliest possible moment either by purse string or mattress suture (Fig. I, B) or by suturing into an overlapping position a plug of omentum. (Fig. I, C.) If operation is delayed longer than six hours after acute perforation takes place the mortality mounts with each six hour period of delay. Prior to six hours after perforation excision of the ulcer or even posterior gastrojejunostomy may be undertaken with caution provided, of course, some other factor has not markedly lowered the patient's general resistance. In cases wherein marked narrowing of the lumen of the bowel results from the closure of the porforation, gastrojujunostomy may be necessary adjunct to the treatment. Subacute exacerbations of chronic perforating ulcer are preferably treated by rest to the organ either medical, as outlined for initial hemorrhage, or by the aid of jejunostomy. Later, the chronic perforating ulcer in absence of subacute perforating symptoms may be excised with drainage by pyloroplasty gastrojejunostomy or partial gastrectomy.

Gastro-intestinal obstruction resulting from peptic ulcer requires first, preliminary treatment of the associated toxemia and second, surgical relief of the obstruction itself. The toxemia consists of a lowering of the chlorides of the blood, an increase of the blood urea and al-

kali as evidenced by an increase in the carbon dioxide combining power of the blood. These changes are relieved in a few days by the administration of saline and glucose intravenously and by systematic lavage or siphonage of the stomach. Surgical relief of the obstruction by gastro-jejunostomy (Fig. I, M) is usually followed by such marked benefit to the patient that obstruction constitutes one of the chief indications for this operation.

Hour-glass stomach is a complication which occasionally results from spasm or contracture attendant upon or secondary to gastric ulcer. Operations such as multiple gastro-intestinal anastomosis, gastro-gastrostomy and excision of the contracture have been quite generally discarded in favor of partial gastrectomy (Fig. I, N,O). In rare cases sleeve resection (Fig. I, P) may be applicable.

The complication of malignant degeneration of gastric ulcer moves the patient into another field of gastric surgery. These cases will be managed adequately, however, if the principles laid down for treatment of gastric ulcer in general are observed.

1930 Wilshire Blvd.

Treatment of War Injuries to the Chest

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Here is valuable information on emergency chest surgery that is well presented. Readers would do well to heed.—The Editor.

I FIND that the handling of wounds of the chest in the essential characters that have to do with life, does not differ greately in war and in civil life.

In these cases there is a very narrow margin of safety owing to the vital nature of the heart and lungs. The immediate factors present are shock, often hemorrhage and disturbance of the normal negative pressure of the chest upon which respiration and circulation of blood depend. Motion or flapping of the mediastinum may be caused with fatal obstruction to respiration.

There is a difference in that war injuries, with the exception of bayonet and knife wounds, are caused by fragments of greater or less size, often jagged, irregular and of unusual shapes. Also in the wounds and often in the chest is a variable quantity of debris of different sorts. The wounds are seldom clean and require greater care.

PRINCIPLES OF WOUND THERAPY

The first principle then in treating external wounds is careful debridement as in wounds alsewhere. Compound fractures of the ribs and wounds of soft parts require cleaning and closure if seen in the first eight hours.

A war wound not often seen in civil life is the blast injury. A man may be killed by blast, no external wound showing. The pathological change occurring is multiple alveolar hemorrhages. However, in some of these cases, death is not immediate and symptoms may be delayed two to five days. There is tachycardia, restlessness, dyspepsia, cough and blood-tinged sputum. Treatment is absolute rest, sedation, oxygen.

Deeper chest wounds may injure the lungs, heart or aorta or large vessels, mediastinum or diaphragm, or smaller structures.

Wounds of the aorta or cavae and perhaps the azygos and larger pulmonary arteries or veins will often prove fatal before treatment is available.

The simplest remediable injury is that to an intercostal vessel. In certain cases these may be controlled by the insertion of a mushroom type of pack to cause pressure on the vessel. This is temporary and must be followed by ligation. In many cases, and in injury to the internal mammary vessels, ligation must be done at once, frequently following a small rib resection.

Wounds of the lung are of two principal types, the closed penetrating and the open or sucking. The primary treatment must always be that of shock. No operative intervention is justifiable until shock is controlled and as accurate a diagnosis as possible is made.

Injury to the lung is shown by shock, usually some hemoptysis, subcutaneous emphysema, and soon, due to spontaneous pneumothorax or hem-

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orrhage there is tympany caused by air in the pleura or increasing basal dullness due to blood accumulation.

It is dangerous and often fatal to operate immediately upon such a case. However, if the wound is an open, sucking one, this must be closed immediately. A tight rubber pad may be sufficient. Otherwise a few superficial sutures must be used or the lung may be drawn into the opening. We then have a closed wound. In these cases often the pressure of air in the pleura and the ensuing collapse of the lung control the hemorrhage.

However, if prolapse of the lung through an open sucking wound has occurred, it should be held in position while debridement is carried out. Positive pressure anesthesia is here useful if available. Tears in the lung which may have been caused by fractured rib ends are then repaired. The chest is then closed and water seal drainage established in the presence of infection.

At times of course we may have an excessive spontaneous pneumothorax. This can be caused simply by a rib fracture, when the lung is torn. Excessive air pressure pushes the mediastinum over and can even cause compression of the opposite lung. Excessive pneumothorax on the right side of the chest especially may collapse to some degree the venae cavae and thus embarrass circulation even without undue pressure on the left lung. In these cases the blood pressure drops markedly and collapse may ensue. Removal of air is the treatment and this may have to be done repeatedly if the hole in the lung does not close.

In a closed wound, the collection of blood in the pleura may cause sufficient pressure on the lung to stop the hemorrhage. In this case, the accumulated blood must be aspirated after twenty-four hours and replaced with air. According to Edward and Davies[1] about 70% of all chest wounds are complicated by hemothorax. The withdrawal of blood and replacement of air is shown to be much the best treatment, Berry[2] states, according to records of the New York police force. When it was not done there was 26% mortality in seventy-six cases. When carried out there was no mortality in seventeen.

If hemorrhage from the pulmonary vessels, however, is not controlled as shown by continued blood-spitting, increasing pulse rate and pallor, or filling of the chest with blood, aspiration and auto-transfusion must be used and when shock is controlled the chest must be opened and the bleeding vessels ligated or the affected lobe resected. Fragments of bone and debris should be carefully removed from the chest and closed intercostal drainage with water suction be established. Sulfathiazole powder may be left in the pleural cavity. The patient is placed on the affected side and strapping may be used to limit motion.

Wounds of the diaphragm need not be repaired immediately unless of such size that marked herniation into the chest has occurred. In these cases abdominal injuries may complicate the picture.

An important condition that can cause death if not relieved is mediastinal emphysema. This may be overcome by a simple superior mediastinotomy done in the neck.

Chylothorax from injury to the thoracic duct is treated by repeated aspirations of chyle from the chest.

Pulmonary collapse or atelectasis of lobes of the lung does occur. In cases described by Zuckschwerdt and Pickel[3] the cause was thrombus occulating a bronchus or swelling and narrowing of the bronchial lumen produced by injury to the bronchial mucosa.

The clinical signs are dullness over the area, diminished or absent breath sounds, displacement of the heart toward the affected side. There is dyspnea, rapid pulse and sometimes collapse. The fluoroscope shows shadow in the affected area, the heart and mediastinum moved toward the affected side and elevation of the diaphragm.

The authors state that coughing may dislodge the bronchial obstruction. Otherwise, after shock is sufficiently abated bronchoscopy should be done. Dyspnea may be relieved by artificial pneumothorax which tends to overcome the shift of the heart and mediastinum.

Berry[2] reports a case of fracture of the bronchus from a crushing injury to the chest and atelectasis of the lung. This had occurred five years previously and pneumonectomy was performed.

HEART WOUNDS

The wound requiring operation as soon as seen is that to the heart. Here, there is hemorrhage into the pericardium and there is quickly set up the condition known as cardiac tamponade. The increasing blood pressure in the

pericardium will eventually cause heart stoppage and many of these cases will not be seen soon enough for surgery. They do not always collapse at once. Elkins[4] says that when tamponade is produced slowly the venous pressure may rise enough to maintain circulation for days.

With cardiac tamponade there is a feeble pulse, congestion of the superficial veins, cyanosis of the face and tongue, weak and often irregular heart sounds, lowered arterial and raised venous pressure. The fluoroscope shows diminished cardiac pulsation.

A needle may be inserted into the pericardium but will accomplish little because there is early clotting of blood. Removal of blood also may set up fresh bleeding. Therefore, this should be used only as temporary expedient to relieve pressure.

At operation the heart is exposed by an incision over the 4th to 6th left costal cartilage near the sternum. The pleura must be pushed aside and not injured if possible. The pericardium is found tense, bulging and blue. The tear in it is enlarged and the heart exposed. The blood in the pericardium is quickly aspirated and all clots removed. A finger is immediately placed over the rent in the heart which is then closed with fine black silk sutures. The pericardium is then repaired loosely and the wound closed without drainage.

In all of these cases we have discussed, postoperative care is of the greatest importance. Oxygen and frequent blood transfusions are valuable and sufonamides for the control of pneumonia. Bronchial secretions must be freely eliminated, by tracheal catherter if necessary, and in lung conditions every effort must be made to reexpand the lung. Fluids must often be drawn from the pleura and if sepsis occurs, treatment of empyema must be instituted.

For anesthesia, morphine and scopolamine followed by sodium pentothal is recommended or ether or cyclopropane with a high percentage of oxygen. For intrathoracic operations some type of inhalation anesthetic under positive pressure is essential.

In summary:

1. Careful debridement is essential.
2. The primary treatment is that of shock.
3. Pulmonary bleeding is often controlled by spontaneous pneumothorax or bleeding into the pleural cavity.
4. Open sucking wounds of the chest must be quickly converted into closed ones.
5. Hemothorax must be treated by aspiration and air replacement.
6. Immediate operation is required for penetrating wounds of the heart.

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Pathological Physiology of the Liver

II. General Metabolism

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IN a previous paper on this program[1] the relation of the liver to the regulation of the cell content, the circulating volume and certain physico-chemical properties of the blood, was discussed. This paper will be devoted to a consideration of the role of the liver in the general metabolism of the body as a whole; in the special metabolism of proteins, carbohydrates and fats; and in certain poorly understood fatalities commonly designated as "liver deaths".

The liver and skeleton muscles, partly because of their mass but chiefly because of their intense chemical activity, produce most of the heat of the body. Removal of the liver from an experimental animal reduces its body temperature several degrees. Furthermore, under normal conditions, because of its great production of heat and because of its complete insulation as a result of its position deep in the body, the internal temperature of the liver is higher than

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that of any other organ. Elevation of temperature increases the speed of chemical reactions. Its relatively high temperature may therefore account for the fact, emphasized by Mann, that the liver carries out its metabolic processes rapidly.

STORAGE

The liver is the only organ that stores nutrient materials to be used by other organs of the body. Its storage of glucose by polymerizing it into glycogen will be discussed in some detail later in this paper. The liver does not normally store fat, but in various pathological conditions this substance may accumulate in the liver in huge quantities. The storage of protein is not a specific function of the liver, as is that of sugar. The protein supply of the liver consists of that in the substance of its own cells. But this substance is shared liberally with the other organs when they need it. Thus, in a short fast, as demonstrated in experimental animals, the liver may lose 20 per cent of its protein during a period in which other organs lose only 2 per cent. In prolonged fasts, 40 per cent of the protein of the liver may disappear. The liver is constantly either storing glucose and protein or liberating them into the blood stream. Which of these processes is active at any particular moment is determined by the general metabolic needs of the body. As pointed out by Mann the liver responds to, rather than controls, the general metabolic processes.

Certain products of digestion absorbed from the intestines are not readily utilized by the cells of the body. The liver transforms these into substances from which the body can obtain energy or build tissue. As examples of this function is the transformation of levulose and galactose into glucose, the only carbohydrate which the cells can use easily and economically; and the reduction of chemically inert saturated fats into chemically active usable unsaturated fats. All these functions are disturbed in extensive injury to the hepatic cells.

Alterations in the functions of the liver may occur in response to changes in the general metabolic requirements of the body. For example, in diabetes mellitus the liver does not store glycogen either because of the necessity of maintaining a hyperglycemia to compensate for the constant loss of sugar in the urine, or because the lack of insulin renders the liver incapable of performing this function.

The relation of the liver to vitamin K was discussed in the previous paper. This origin is also concerned with other vitamins. It manufactures vitamin A from carrotene. It stores vitamin D, and is rich in vitamin B and G. The functions of the liver with reference to all these vitamins are markedly reduced in extensive disease of this organ. The serious vitamin deficiency, particularly in the B group, which is so common in chronic alcoholism is probably related to the effects of alcohol on the liver.

BILE FORMATION

One of the specific functions of the liver is the formation of bile acids and their salts. These substances are essential to the digestion and absorption of fats which are the body's chief source of energy. They are less readily oxidized than glucose which is the emergency fuel; but without fats serious general metabolic deficiencies result. Any of the pathologic conditions that result in the failure of bile acids to reach the intestine, such as obstruction of the common bile duct, long continued bile fistula and inability of the liver to manufacture bile acids, are accompanied by general metabolic disorders due to lack of available fat.

CHEMICAL ROLE

Hence the liver plays a multiple role in general metabolism, (1) in a direct manner, by furnishing a considerable portion of the body's heat; in more indirect ways, (2) by storing glucose and protein for use in other parts of the body when needed; (3) by transforming poorly utilizable food materials into other substances readily used by the cells; (4) by storing vitamins and other accessory nutrient elements for the general use of the body; and (5) by making possible the absorption from the intestines of the essential food element fat that supplies the greater part of the energy of the body.

Proteins taken as food are digested in the stomach and intestines and are broken down into their constituent amino acids. These are absorbed into the capillaries of the intestinal mucosa and carried thence in the blood directly to the liver. Here the excess of amino acids, over and above the quantity needed for maintaining the tissues of the body, including the liver itself, are altered by the hepatic cells. The

non-combustible amino—i. e., the NH_2—group is split off from the molecule of the amino acid to form ammonia, leaving a short chain ketonic acid as a residue of the simpler amino acids, such as glycine and alanine, and more complex residues from such amino acids as tryptophane and tyrosine. The ammonia thus produced is combined with carbon dioxide by the liver to form urea which is excreted almost wholly by the kidneys and constitutes 80 to 90 per cent of urinary nitrogen. Extensive injury to the liver or its complete removal in experimental animals, results in a rapid reduction of the urea of the blood, provided the kidneys are still functioning, and an increase in the amino acids of the blood. Crystals of the amino-acids, leucin and tyrosin, may be present in the urine in cases of extensive destruction of liver tissue as in acute yellow atrophy. These crystalline amino acids are derived in part from the undeaminized amino acids absorbed from the intestines after the digestion of protein but chiefly from autolysis of necrotic liver cells.

The short chain ketonic residues of the deaminized amino acids are transformed by the liver into glucose by the process of gluconeogenesis, or they are completely oxidized to carbon dioxide and water. Some of the simpler amino acid residues, such as those from glycine and alanine, are very readily combined into glucose. The liver is apparently the only organ capable of accomplishing this transformation. Destruction of a large portion of the liver substance reduces this function.

A portion of the protein molecule or of its constituent amino acids is converted in the intestine by the action of bacteria, into toxic substances. Tryptophane, by deamination and decarboxylation, is transformed into indole and skatole, tyrosine, by similar processes, into phenol. Other toxic substances—ethylamine and tyramine—are also produced by bacterial action, the former on alanine, the latter on tyrosine. The known formation of these substances in the colon was the basis of the concept of autointoxication, once so popular in medicine and of Arbuthnot Lane's designation of this part of the bowel as a cesspit. But it is now known that these substances are produced in relatively small amounts and are only partially absorbed into the blood stream from the intestinal contents. After absorption they are carried to the liver where they are detoxified and rendered harmless by conjugation in the hepatic cells either with sulphate ions or with glycuronic acid to be excreted by the kidneys, the former as the "etherial sulphates", such as indican, of the urine. The mechanism of detoxification is well illustrated by the fate of ingested benzoic acid. This is conjugated in the liver with glycine to form hippuric acid which is then excreted by the kidneys. This function is reduced roughly in proportion to the degree of damage to the liver itself in different diseases. Hence the amount of hippuric acid which is excreted by the kidneys after the administration of benzoic acid is a useful measure of the extent of damage suffered by the liver.

Other poisonous substances absorbed from the intestines or produced in the body itself are detoxified in the liver by various processes, such as oxidation, reduction, methylation and acetylation. Some exogenous poisons such as bichloride of mercury, and such drugs as cinchophen and salicylic acid, are excreted by the liver in the bile. The Kupffer cells of the liver, which are an important part of the reticuloendothelial system, remove bacteria and colloidal poisons from the blood and are probably concerned in the formation of antibodies.

In connection with the detoxifying function of the liver there are certain interesting similarities between the effects of an Eck fistula and cirrhosis of the liver. In the former, the blood of the portal vein is diverted from its normal course through the liver by anastomosis of that vessel with the inferior vena cava. Animals with Eck fistulas suffer profound intoxication and may die when fed large quantities of protein. This is apparently due in large part to the continued absorption directly into the general circulation of poisonous substances produced by bacterial action or otherwise upon products of protein digestion in the intestine—a true autointoxication. Normally these substances are first carried to the liver in the portal blood where they are detoxified and transformed into harmless substances before they reach the systemic circulation. Eck fistula dogs do better on a high carbohydrate diet or when a substance which yields glycuronic acid, e. g., chondroitin, is administered. In cirrhosis of the liver, because of obstruction of the flow of blood through that organ, much of the blood from the intestines,

with its absorbed toxic products, is shunted through collateral channels directly into the general circulation. Hence in this disease a part of the poisonous substances produced in the intestines does not reach the liver for detoxification. In animals with Eck fistulas all of these toxic substances reach the systemic circulation, hence the greater intensity of protein intoxication in this condition; in cirrhosis of the liver only a part of them reach the general circulation and the intoxication is less severe. The difference is only one of degree.

Thus the liver performs several functions—detoxification of poisonous substances, serving as a reservoir for excess blood in preventing overburdening of a crippled heart and aiding in removing excess water from the blood stream—functions which serve to protect the remainder of the body from deleterious effects of various kinds. Diseases of the liver reduce one or more of these protective functions.

The polysaccharides of the food are decomposed in the intestine into monosaccharides, which are then, like the products of protein digestion, absorbed into the blood and carried directly to the liver. Here the monosaccharides fructose and galactose are transformed into glucose. The glucose which is absorbed as such from the intestine together with that produced by the transformation of fructose and galactose the liver upon the residues of the deaminized and that formed by the gluconeogenic action of amino acids from protein digestion and upon lactic acid, is polymerized into glycogen and stored in the liver for future use by the body as a whole. From all these sources the liver acquires on an ordinary diet a considerable store of glycogen. The deposition of glycogen begins in the hepatic cells about the central vein and extends toward the periphery of the lobule. Mobilization of sugar and removal of glycogen takes place in the opposite direction.

SUGAR METABOLISM

Although glycogen is stored both in the liver and in cardiac and skeletal muscle, only that in the liver is readily available as a source of glucose for transportation in the blood to other organs. Hyperinsulinism quickly depletes the store of liver glycogen but has relatively little effect upon that in muscle. Hyperthroidism reduces the glycogen content of both liver and muscle, the decrease being greater in the former than in the latter. Adrenalin depletes the store of glycogen in liver by discharge of glucose into the blood, and that in the muscles by the discharge of lactic acid which is transported to the liver where it is transformed into glucose. These differences in the effects of various agents upon the glycogen stores of liver and of cardiac and skeletal muscles, respectively, are probably due to differences in the function of glycogen in these locations. During contraction of muscle glycogen is transformed into lactic acid through the intermediary of hexose phosphate and during rest, e. g., during diastole in cardiac muscle, glycogen is regenerated from lactic acid by way of hexose phosphate. Glycogen in muscles is, therefore, essential to their proper functioning. On the other hand, glycogen is apparently stored in the liver solely for the purpose of supplying the needs of the body for glucose. Hence sugar is mobilized quickly and easily from liver glycogen and only with difficulty from muscle glycogen.

The polymerization of glucose into glycogen in the liver is accomplished by the enzyme glycogenase, which is probably a reversible enzyme capable both of building up and of breaking down molecules of glycogen, depending upon conditions. In any case, when sugar is needed by the tissues for energy purposes, liver glycogen is decomposed into glucose which is then liberated into the blood stream. There appears to be a condition of homeostasis between the level of blood sugar and the amount of glycogen in the liver, that is, when the blood sugar is at or above the normal level, sugar is stored in the liver as glycogen, but when the level of blood sugar is lowered glycogenolysis occurs and glucose passes into the blood stream.

Various conditions can interfere with the balance between liver glycogen and blood sugar. In diabetes mellitus, the absence of insulin prevents the storage of glycogen in the liver and the blood sugar is constantly at an abnormally high level. In hyperthyroidism, the constant demand for sugar for energy purposes because of the greatly augmented general metabolism, causes depletion of the store of glycogen; the level of blood sugar may occasionally be higher than normal and, in rare cases, some of it may escape in the urine. The injection of adrenalin, overactivity of the adrenal medulla and an excess of the diabetogenic substance of the

pituitary cause a mobilization of sugar and if maintained for any length of time depletes the store of liver glycogen.

The glycogenic function of the liver is closely related to sugar tolerance tests. The normal blood sugar curve in such a test does not rise very high and falls rapidly to normal because the liver is able to remove glucose from the circulating blood and to transform it into glycogen at a rapid rate. If the glycogenic power of the liver is lowered for any reason, as for instance by the absence of insulin, then the liver is unable to remove sugar from the blood and store it as glycogen at the normal rate, the blood sugar reaches a high level and remains high for a much longer period of time than normally.

The galactose test for liver function is based upon the fact that it is moderately difficult for the liver to transform this sugar into glucose. Since this transformation must be accomplished by the hepatic cells before the sugar can be stored as glycogen, any extensive damage to the liver will interfere with this process. Because of the slow rate at which this transformation is made under such conditions, the galactose remains for a longer time in the blood stream and a greater quantity is excreted in the urine. Prolonged galactosemia and excessive galactosuria after the ingestion of this sugar are indications of injury to the liver by disease.

In 1929 v. Gierke described two cases of a peculiar disease to which he gave the name thesauriomosis glycogenica or glycogen-storage disease. This condition is limited, apparently, to infancy and childhood. It is characterized by the accumulation of huge quantities of glycogen in the parenchymatous cells of different organs due either to some disturbance of carbohydrate metabolism or to defective mobilization of sugar. Two types of this disease have been described. In the cardiac type the heart may be from three to seven times the normal size as a result of accumulation of glycogen in the muscle fibers. In the hepatic type the liver may be three or four times its normal size and its cells are packed with glycogen granules. Blood sugar is low due to loss of the power of glycogenolysis by the liver. Furthermore, in ordinary cases glycogenolysis occurs rapidly so that within two or three hours after death practically all the glycogen has disappeared from the liver. In von Gierke's Disease, on the other hand, the glycogen content of the liver remains unchanged for many hours after death.

FAT UTILIZATION

The liver plays a double role in the utilization of fats by the body. In the first place, it must produce bile acids in adequate amount in order that fat may be digested and absorbed from the intestine. Unlike the products of digestion of protein and of carbohydrates, which are absorbed into the blood stream and carried directly to the liver fat enters the lymphatics and reaches the liver only by way of the general circulation. Having entered the general circulation first, the fat stored not in the liver primarily but in the fat depots, namely the subcutaneous and retroperitoneal tissues and the mesentery and omentum, which are the normal storage places for fat as the liver is the normal storehouse of sugar. But there is a further difference, in that the fat is stored in its depots as such, that is as neutral fat, while sugar is stored in the liver in a polymerized form as glycogen. Most of the fat in the depots is saturated fat, because this is the type that predominates in the diet. Saturated fat is inert chemically; to be used by the body it must be desaturated. This process is apparently achieved only in the liver. Certainly the greater part of the fat in this organ is unsaturated. It is also probable that fat is transferred from the depots to the liver in appreciable amounts only when the energy needs of the body are not being adequately supplied in the diet, as in starvation when the fat content of the liver may be very greatly increased. Whether the liver is actually capable of desaturating fat or whether it has a selective action and takes only unsaturated fat from the blood is not not known with certainty. But it is the general opinion, and this is the second role of the liver in the utilization of fat, that the liver does convert inert saturated fat into the chemically active unsaturated form which can be used or burned by the tissues for energy purposes.

Although the liver is not concerned in the storage of fat no other organ of the body becomes so overloaded with fat as does the liver under certain conditions. There is no pattern for the deposition of fat in the liver as there is for glycogen. Perhaps this is due to the relation of these two substances to the functions of the liver. Storage of glycogen is a normal function

of the hepatic cells, and, except in v. Gierke's disease, it never accumulates in such abnormal quantities as to interfere with their other activities. On the other hand, the liver cells may become so loaded with fat that the cytoplasm is reduced to a very thin ring and the nuclei are compressed and flattened against the cell wall and little room remains for glycogen or protein. The functions of such cells are depressed.

There is a sort of reciprocal relationship between fat and glycogen in the liver. In conditions in which the amount of liver glycogen is low, fat may accumulate in large quantities, as in diabetes mellitus and in starvation. Best and his co-workers have shown that the quantity of fat in the hepatic cells is correlated with the amount of choline, or substances in the diet such as lecithin, from which choline may be derived. When choline is deficient, fat accumulates in the liver in large quantities. The presence of adequate amounts of choline prevents the accumulation of fat in the liver and causes it to disappear rapidly if it has already been deposited.

An interesting relation also exists between the amount of fat or glycogen in the liver and its susceptibility to certain types of injury. Chloroform and phosphorus are poisons which have a selective action on the liver. This organ can tolerate much larger quantities of these poisons, both of which are soluble in fat, if it is well stored with glycogen than if its supply of glycogen has been replaced by fat. A diet rich in protein is said also to have such a protective action. A hepatic cell distended with fat is, in large measure, deprived of its two most effective protective constituents—glycogen and protein. Whether this effect of high protein diet is due to an increased store of glycogen by the process of gluconeogenesis from the augmented supply of ketonic acid residues of deaminized amino acids, or to some other factor, is not fully known. The liver is extensively damaged in the toxemias of pregnancy, in eclampsia and in acute yellow atrophy. A high carbohydrate diet is indicated in these conditions in order to increase the amount of glycogen in those cells of the liver which are still capable of storing it. By this means the undamaged hepatic cells may be protected from injury and the condition of these cells not too seriously injured may be improved.

Diabetic coma is largely the result of the formation of ketone substances in the body as a result of disordered metabolism of fat which, instead of being completely burned to carbon dioxide and water, is transformed into acetone and diacetic and oxybutyric acids. The liver is apparently the only organ in which this process of ketosis can take place. Whether ketosis is the result of disordered function on the part of the liver or is an adaptive mechanism by which this organ attempts to dispose of residues of fat incompletely burned by the tissues, is not fully understood.

What has been said thus far is concerned with the relation of the liver to the metabolism of neutral fats. It is also concerned with the disposition of other substances which have some of the characteristics of fat, particularly cholesterol. This substance is excreted by the liver in the bile, and is one of the chief constituents of gall stones. The amount of cholesterol excreted in the bile is roughly proportionate to the quantity of this substance in the blood. It is doubtful whether either hypo- or hypercholesterolemia is a measure of liver function. In general, it may be said, however, (1) that hypercholesterolemia is present in simple obstructive jaundice, but is absent when the jaundice is accompanied by injury of the liver from biliary infection; (2) that cholesterol of the blood is normal or low in jaundice due to extensive degenerative changes in the liver; and (3) hypocholesterolemia usually occurs in acute yellow atrophy and in cirrhosis associated with jaundice. However, there is considerable evidence that the liver is concerned with maintaining the normal proportion of cholesterol and its esters in the blood. In degenerative disease of the liver the relative amount of ester is reduced. In rapidly fatal cases of hepatic damage cholesterol esters may disappear completely from the blood. Hence the determination of the proportion of cholesterol and its esters in the blood is often used to measure the efficiency of the functional activity of the liver.

BILE AND BILE SALTS

The activities of the liver thus far considered have involved substances which are either taken from or returned to the blood. These activities may well be described as the internal secretory functions of the liver. Bile is the one external excretion of the liver. Of its various constituents, bile pigments and cholesterol are formed

outside the liver and are merely excreted by it. Bile acids and their salts are the one specific contribution of the liver itself to its external secretion, for they are manufactured only by the hepatic cells.

Bile salts exert their chief action in the intestine, but upon re-absorption also affect the functional activity of the liver itself. Their presence in the intestine is necessary for the digestion and absorption of fats and for the absorption of cholesterol, carrotene, and vitamins D, E and K. They also facilitate the absorption of calcium and iron. By keeping cholesterol in solution they aid in preventing its precipitation in the gall bladder and the formation of gall stones. They are the most potent stimulants of the secretion of bile.

A. C. Ivy and his co-workers have added much to our knowledge of the normal and pathologic physiology of the secretion of bile and little can or need be added to a brief summary of their work. In the first place three definitions are essential to an understanding of what is here presented. *Cholagogues* stimulate the evacuation of the gall bladder and increase the flow of bile into the intestine but do not increase the rate of secretion by the liver. *Hydrocholeretics* increase the volume of bile but do not stimulate the secretion of the constituents of bile. *Choleretics* augment the flow of bile and increase the secretion of its specific constituents.

The secretion of bile is reduced during fasting. Meat, particularly liver, stimulates the formation of bile either when taken alone or in a mixed diet. In fasting animals, sugar decreases and olive oil increases the flow of bile, but when added to a mixed diet neither has any perceptible effect. Very few drugs increase the secretion of bile. Calomel, in spite of its long clinical reputation to the contrary, is without effect. Acetylsalicylic acid is an active hydrocholeretic, increasing the volume of bile by about 59 per cent but decreasing the secretion of cholates slightly. Bile salts themselves are the most active stimulants of the secretion of bile and its specific constituents. Normally bile salts are absorbed from the intestine and resecreted by the liver. In this entero-hepatic circulation of bile salts there is a loss of about 10 to 15 per cent. This daily loss is made by the manufacture of new bile salts by the liver. Extensive injury to the liver will obviously interfere with this function.

Bile salts are extensively used as therapeutic agents. To be effective such therapy must be based upon an understanding (1) of the pathology conditions in which bile salts are indicated, (2) of the type of bile salt to be used to accomplish the desired effect, and (3) of the mechanisms by which the different effects are produced. As general principles, it may be stated (1) that oxidized unconjugated bile acid derivitives, such as the proprietary preparations dechilin and ketochol, act as hydrocholeretics, for they more than double the volume of bile while reducing the secretion of cholates by about one-third; (2) conjugated ketocholanic acids (such as are contained in the proprietary preparation dechacid) and normally occurring conjugated cholic acids (as in normal bile and in the proprietary preparation bilron) are the most satisfactory choleretics for they increase both flow of bile and the secretion of bile salts.

In view of the above principles it is relatively easy to summarize the pathologic conditions in which bile salt therapy is indicated. On obstructive jaundice when no bile reaches the intestine, the administration of bile salts will aid in the digestion and absorption of fat and in the absorption of vitamin K and other desirable substances from the intestine. The administration of bile salts in obstructive jaundice does not appear to be dangerous because it has been found that the salts so administered are rapidly excreted by the kidneys. After operations on the bile ducts, particularly when a drainage tube is left in the common duct or in the gall bladder, the administration of oxidized unconjugated bile acid derivatives will induce a copious flow of dilute bile that will flush out the bile passages and drainage tube and thus prevent blockage and also aid in preventing ascending infection. In diseases of the liver in which this organ is unable to produce bile salts in adequate amounts, the administration of conjugated cholic acids will relieve the damaged liver of part of its burden of supplying bile salts. For it would seem to be easier for a damaged liver to excrete a ready formed substance than to produce the substance *de novo*. By this means sufficient bile salts may be added to the intestinal contents to permit the digestion of fats and thus avoid the general metabolic dis-

turbances which follow failure to absorb this food element.

LIVER DEATHS AND HEPATO-RENAL SYNDROME

"Liver deaths" and the hepatorenal syndrome are of interest to both surgeons and internists. About the beginning of the present century when chloroform was extensively used as a general anesthetic, an occasional patient would die from three to five days after operation with fairly characteristic symptoms said to be due to "delayed chloroform poisoning". But with the substitution of newer and better general anesthetics that did not have the specific toxic action on the liver that chloroform was known to have, unexpected deaths following operations continued to occur. Heyd, in 1924, was the first to offer a reasonable explanation for these deaths, which he described as "liver deaths". Heyd's cases fell into three fairly well defined groups.

Group I included patients who were usually obese, appeared to be good surgical risks and underwent an uncomplicated operation for disease of the biliary tract. Recovery from the anesthetic was delayed, the temperature rose steadily to 106 degrees F. or higher and, with developing coma, the patient died in from 24 to 48 hours after the operation. The hyperpyrexia was the outstanding clinical characteristic.

Group II included patients that were usually jaundiced and gave a history of previous biliary tract disease, but still appeared to be moderately good surgical risks. Convalescence proceeded well for 36 to 48 hours when irritability and nervousness occurred, the temperature rose steadily to 106 degrees F. or higher, and the patient died in from 24 to 48 hours after the onset of symptoms, or 60 to 96 hours after operation, frequently from circulatory collapse. In this group also hyperpyrexia was the most prominent clinical feature.

In Group III, the patient had undergone a somewhat similar operation and convalesced nicely for some five days when rather suddenly developing somnolence followed by coma, accompanied by oliguria and anuria, ended in death on the 6th to the 10 day. In these cases the non-protein nitrogen of the blood was found to be increased and the patient evidently died in uremia.

All Heyd's cases had undergone surgical procedures involving the biliary tract. Later Helwig and Orr and their co-workers pointed out the interrelations of the liver and kidneys in the third group and added cases other than those which had been subjected to operation upon the biliary tract. Particularly did they stress the effects of traumatic injury to the liver in these cases. Later Wilensky listed a great variety of conditions with which this syndrome may be associated.

In all the cases of all groups of "liver deaths" which came to autopsy the liver showed marked noninflammatory degenerative changes. The organ was fatty and contained numerous areas of necrosis. In patients dying on the 5th to the 10th day in addition to the evidence of extensive damage to the liver, there was marked degeneration of the epithelium of the proximal convoluted tubules and Henle's loop of the kidney with grandular detritus and casts in the lumens of the tubules. It appears that these three groups do not represent three different pathologic conditions but rather different stages in one disease. The earliest change occurs in the liver. Hence the pathologic changes found in patients who die during the first three or four days are limited to the liver. However, if the patient survives for 5 days or more the kidneys also become involved. The explanation of this condition requires a brief discussion of the interrelations of the liver and kidneys.

The kidneys are organs of elimination charged with the duty of removing waste products from the blood stream. If the kidneys are to be protected against damage themselves, the waste products which they excrete must be rendered harmless either at their source or at some way station in the circulation. The chief and possibly the only organ in which poisonous substances are detoxified is the liver. Toxic products of bacterial origin in the intestine are carried directly to the liver where they are rendered harmless to the kidneys by processes already described. Indole, for example, is poisonous to the renal parenchyma. In the liver this substance is combined with a sulphate and a potassium ion to form indican which does not damage the kidney during the process of its excretion. The presence of large amounts of indican in the urine therefore simply means that a large amount of indole in being formed in the intestines and that it is being successfully transformed in the liver to harmless indican. Indicanuria is not, therefore, a sign of auto

intoxication; indoluria, on the other hand, would be such an indication. The latter could well occur if the liver was sufficiently damaged to render it incapable of changing indole to indican.

Extensive injury to the liver starts a vicious circle. If the changes in the liver occur rapidly, as after some violent injury to its parenchyma, the patient may die before the circle is complete, that is, before evidence of renal insufficiency appears. This is the type of "liver death" in which the patient survives the operation or the onset of the symptoms for only a short period of 24 to 72 hours. On the other hand, if the injury to the liver is less rapid or less violent, undetoxified poisons from the intestines or developed elsewhere in the body reach the kidneys and injury to these organs begins. Degenerative changes in the liver and kidneys then progress together. To the poisons which the damaged liver is unable to detoxify are added the products of autolysis of the injured and necrotic hepatic tissue. This constitutes the rounding out of the vicious circle. The degenerative changes in the kidneys so interfere with their function that the non-protein nitrogen of the blood rises, oliguria followed by anuria develops and the patient dies of uremia.

This concept of "liver death" and the hepatorenal syndrome has not been universally accepted. In the first place, it is urged that this condition develops in only a relatively small percentage of patients who have been subjected to surgery. Boyce and others have attempted to circumvent this criticism by suggesting that those patients who do suffer from this condition are "liver weaklings", that is, that there is something in their constitutional make-up that renders their lives less resistent to injurious agents. A similar explanation has been offered for the occasional occurrence of acute yellow atrophy of the liver in patients who have taken cinchophen. But there seems to be no very satisfactory way either to prove or to disprove such a view. In the second place, it is objected that the injurious agents that can give rise to this condition and the diseases in which it occurs are too varied for this to be a definite entity. This, however, is not a valid criticism because it is known that such widely different chemical substances as phosphorus, chloroform, carbon tetrachloride and di-ethylene glycoll have a selective toxic effect on the liver and also damage the kidneys.

In 20 cases of "liver death" following decompression of bile ducts obstructed by carcinoma of the head of the pancreas, Stewart and Lieber found regularly disruption of the intralobular architecture with disorganization and dissociation of the cords of hepatic cells. Associated with these changes there was necrosis of the inner third, sometimes extending into the midzone and periphery of the lobules. From a study of a large series of cases of other types, these authors were convinced that this combination of changes in the liver does not occur with any degree of frequency in any pathologic condition other than surgical decompression following total biliary stasis.

Attempts to reproduce the hepato-renal syndrome in experimental animals has not been successful. Practically all of these experiments have been limited to the use of extracts of injured, autolyzing liver, even including extracts of the livers of patients who had died of this condition. But all these experiments appear to have omitted a study of one very important factor. Perhaps it is not substances that develop in the liver itself that initiate the vicious circle, but toxic substances which originate elsewhere, for example, in the intestine, which the liver is unable to detoxify. Until this angle of the problem is investigated, and it does not appear to have been studied up to the present, failure to reproduce the syndrome in experimental animals is not a valid argument against the existence of such a condition.

It must be admitted that the concept of "liver deaths" and of a hepatorenal syndrome has not been completely established. However, the clinical and pathological evidence of disturbed hepatic function as a basis of this condition is fairly clear. Because practically all the varied functions of the liver are performed for the benefit of the body as a whole, this highly altruistic organ is one of the vital structures of the organism. Removal of the liver of an experimental animal results in death in about 24 hours, unless glucose is supplied, when life may be prolonged for a few days. The highly specialized hepatic cells charged with performing so many activities essential to the well being of the body as a whole, are very sensitive to injury. Poisons of various types and from

various sources, imbalances of metabolism and of dietary intake, specific nutritional deficiencies, infections and sudden release of pressure in bile ducts long distended by obstruction, can induce extensive damage to the liver. Injury of hepatic cells causes various types of degenerative changes even to focal and diffuse necrosis. These changes are frequently associated with massive accumulation of fat in the liver cells. In spite of the great susceptibility of the hepatic cells to injury, it is difficult to produce liver insufficiency because of its huge factor of safety and functional reserve. Once this reserve is exhausted there occur disturbances in intermediary metabolism, such as the formation of urea and the polymerization of glucose to glycogen, and secondary disturbances in other organs, notably in the kidneys, which lead to hepatic insufficiency and death. The clinical manifestations of hepatic insufficiency are "hepatic coma" and hyperpyrexia in cases in which death intervenes in 24 to 72 hours after the onset of symptoms; oliguria, anuria and uremic coma when death is delayed until the 6th to the 10th day. Sufficiently extensive damage to the liver deprives the body of manifold essential activities and products. In the presence of the summation of these deprivations the body is unable to maintain life.

The clinical diagnosis of "liver death" and hepatorenal syndrome should be made with great caution. Tuoroff has reported four cases in which such a clinical diagnosis would have been justified but autopsy revealed subphrenic abscess; accidental removal of one wall of the common duct and ligation of the common and right hepatic ducts; gangrenous bronchitis and intraperitoneal hemorrhages; and hemorrhagic pneumonia, respectively.

SUMMARY OF LIVER FUNCTIONS

From the above summary of the various functions of the liver it is evident that this is the most versatile organ of the body. It produces red blood cells during fetal life; it aids in clearing the blood of worn-out red blood cells, stores the usable iron obtained from their hemoglobin and excretes another portion as the waste product bilirubin; it is an important factor in regulation of the blood volume and serves as a protective reservoir, or "flood chamber" against overburdening the heart. The liver manufactures vitamin A from carrotene, and stores vitamins D, E and K and the anti-anemia factor essential to the maturation of red blood cells. It is the source of much of the body heat. It secretes bile acids which are necessary for the digestion and absorption of fat. In the hepatic cells amino acids derived from protein digestion are deaminized, urea is formed out of the ammonia thus released, and the short-chain ketonic acid residues of the deaminized amino acids and lactic acid are transformed into sugar by the process of gluconeogenesis. The liver detoxifies many poisonous substances, particularly those produced by bacterial action upon the products of protein digestion in the intestines and excretes other poisonous substances. It produces ketone bodies when fat metabolism is disturbed, as in diabetes mellitus. It stores monosaccharides as glycogen and regulates the level of blood sugar by its glycogenolytic activity. It excretes cholesterol and regulates the relative amounts of this substance and its esters in the blood. These functions are well established. In addition, there is considerable evidence that the liver is the source of fibrinogen, heparin and prothrombin, elements that are concerned in the coagulation of the blood, and of serum albumin and globulin. It probably also desaturates the saturated fats taken in with the food to render easy their utilization by the cells of the body. It becomes clogged with fat when the supply of choline is inadequate.

The structural pattern of the liver is clear-cut and relatively simple, but the location of none of these numerous functions within its lobules is known. There is nothing in the microscopic appearance of the liver cells in different parts of the lobules to indicate that they perform different functions. Little has been learned concerning the location of these various functions within the hepatic lobules from the more or less selective action of different poisons upon the liver cells. For the necrosis which accompanies poisoning by chloroform and phosphorus and the changes seen in eclampsia and acute yellow atrophy, while they effect in a measure different parts of the lobules, all have much the same effect on the reduction of the functional capacity of the liver.

The liver is a very patient organ. It may suffer severe and extreme damage without making detectable complaint either in the form

of characteristic pain or evident disturbance of function. Because of its great functional reserve, it continues to work with a very considerable degree of efficiency in spite of extensive damage and loss of substance, and refuses to reveal its sufferings clearly by even the most elaborate tests. Because of its multiplicity of functions, there is an equal or greater multiplicity of tests designed to determine the functional capability. Because there are no criteria by which we can determine which cells of the liver deaminize amino-acids, which detoxify poisons or which produce ketone bodies, may it not be possible that this huge and patient organ has not learned the principle of division of labor and that its cells are like the old-fashioned housewife who did all the cooking, serving and dishwashing? If this be true, then it would appear that any good test of liver function, such as the galactose test which determines the liver's ability to transform this sugar into glucose and store it as glycogen, the hippuric acid tool which measures its power of detoxification by conjugation, or the test for urobilinogen in the urine which reveals the ability of the liver to re-excrete this substance, is all that is needed to learn something of its functional capacity. For when one function of the cells is disturbed or decreased it may be that all their other activities suffer in a similar manner. But it must not be expected that any test will wrest from this stoical but benevolent organ complete information concerning its pathological condition.

303 East Chicago Ave.

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AMERICA AT WAR

BULLETIN ON PROTECTION OF HOSPITALS

"Protection of Hospitals", Bulletin No. 3 of the Medical Division of the Office of Civilian Defense, prepared in collaboration with a special committee of the American Hospital Association, has now come from the press in its official form. It was previously published in several hospital journals in order that the material could be used by hospitals at the earliest possible moment.

The bulletin discusses protection of hospitals against air raids under the following heads: Protection of building fabric, patients and personnel; protection of glass; ventilation; protection against fire; rescue squads; air raid shelters; blackout regulations; protection of utilities; facilities for care of casualties; unit system and reserve stocks; the ambulance entrance; morals; distribution of casualties to wards.

Diagrams show how sandbag barricades can be used for temporary reinforcement; how to protect windows against shattering of the glass without cutting off ventilation, and several methods of blacking out. There is a sketch suggesting how an ambulance entrance can be designed to eliminate unnecessary turns and there are also designs for signs to guide ambulances in the blackout.

The section on protection of glass gives detailed instructions on materials that can be used and methods of applying them. Under "Protection Against Fire" there is a description of the various types of incendiary bombs and of the approved methods of fighting them. The report emphasizes the importance of fire and evacuation drills.

VACCINATION AGAINST TYPHUS FEVER, CHOLERA AND PLAGUE

Vaccination against typhus fever, cholera and plague of all U. S. military personnel stationed in or traveling through areas where they would be under serious threat of exposure to these diseases, was recently ordered by the Office of the Surgeon General, U. S. Army, Washington, D. C. The following instructions cover vaccinations:

1: Typhus Fever: The present approved vaccine consists of a suspension of killed, louse-borne, epidemic typhus rickettsiae prepared by the Cox yolk-sac cultured method and obtainable in 20 cc. vials through regular Medical Department supply channels.

Initial vaccination will consist of three injections of vaccine 1 cc. each, administered subcutaneously, with intervals of from seven to ten days between injections. A stimulating dose of 1 cc. will be administered every four to six months as long as serious danger of infection is present, or whenever in the opinion of the

surgeon this additional stimulation of immunity is indicated.

2. Cholera: This present approved vaccine consists of a suspension of 8,000 million of killed cholera vibrios (V. comma) per cubic centimeter, which may be procured in 20 cc. vials.

Initial vaccination will consist of two subcutaneous injections of cholera vaccine with an interval of from seven to ten days between injections. The first dose shall consist of 0.5 cc. and the second dose shall consist of 1 cc. of the vaccine. A stimulating dose of 1 cc. will be administered every four to six months as long as serious danger of infection is present, or when in the opinion of the surgeon this additional stimulation of immunity is indicated.

3. Plague: The vaccine consists of a suspension of 2,000 million killed plague bacilli per cubic centimeter, which may be procured in 20 cc. vials.

The initial vaccination will consist of two subcutaneous injections of plague vaccine with an interval of from seven to ten days between injections, the first dose consisting of 0.5 cc. and the second dose consisting of 1 cc. of the vaccine. Additional 1 cc. doses may be administered whenever in the opinion of the surgeon additional stimulation of immunity is indicated.

Vaccine alone is not adequate for prevention of typhus, cholera or plague, and the practice of vaccination should, therefore, be considered an adjunct to control measures prescribed by the army medical staff.

HOSPITALS TO BE REIMBURSED FOR CARE OF CIVILIAN CASUALTIES

Payment for temporary hospitalization of civilians injured as the result of enemy action has been made possible by a recent agreement between Administrator Paul V. McNutt of the Federal Security Agency and Director James M. Landis of the Office of Civilian Defense. The funds have been allocated to the U. S. Public Health Service by the Federal Security Administrator from funds made available to him from the President's emergency fund. A joint memorandum embodying the details of the program has been issued by Surgeon General Thomas Parran of the U. S. Public Health Service and Dr. George Baehr, Chief Medical Officer of the Office of Civilian Defense.

The plan provides that all hospitals caring for civilian casualties in the event of air raids or other enemy action will be reimbursed by the Federal government at a rate of $3.75 a day. This is the rate of reimbursement established by the Federal Board of Hospitalization for Federal beneficiaries in government hospitals and may be changed as conditions require, it was stated.

Any hospital in the nation, voluntary or governmental, may be used as a casualty receiving hospital in the Emergency Medical Service established by the Medical Division of the Office of Civilian Defense. In addition, certain hospitals and other institutions in "safe areas" may be used as emergency base hospitals for casualties or other patients whom it may be necessary to evacuate from urban hospitals in exposed areas. The new agreement provides that Federally owned equipment may be loaned to the base hospitals and that their staffs will be supplemented by physicians of the region who will be commissioned in the reserve corps of the U. S. Public Health Service. It was emphasized that management and control of all hospitals, both local casualty receiving hospitals and emergency base hospitals, will remain the responsibility of the local or state authorities.

In the establishment of emergency base hospitals, emphasis will be placed on the relative safety of the area and the availability of existing hospitals and other institutions. Hospitals are now being surveyed for this purpose and will be classified on a basis of size, equipment and standards of operation.

It is proposed to begin immediately the organization of medical staffs for future base hospitals as hospital units affiliated with casualty hospitals similar to the affiliated general hospitals of the Army. The physicians, surgeons, specialists and dentists who are to be commissioned in the Public Health Service Reserve for service in these hospitals will receive rank, pay and allowance equivalent to those of the Medical Corps of the U. S. Army. They will be selected from older age groups, from physicians with disabilities that make them ineligible for military service and from women physicians. As far as possible, they will be assigned to service in the regions in which they live. Because they are to function as balanced professional

staffs, they will be recruited from the staffs of civilian hospitals and cleared through the Procurement and Assignment Service.

NURSING SERVICE FOR THE WAR

Nursing service is being rapidly organized to take its place in the civilian defense program. A full time nursing consultant is on duty as a member of the staff of the Medical Division of the Office of Civilian Defense in Washington and the Subcommittee on Nursing of the Health and Medical Committee of the Office of Defense Health and Welfare Services also serves as the Nursing Advisory Committee of the OCD. Through the consultant and the advisory committee the Medical Division is in contact with all Federal agencies that have nursing programs and the Nursing Council on National Defense, which represents national nursing organizations, the Red Cross and Federal agencies.

To assist the Regional Offices of Civilian Defense in interpreting the Emergency Medical Service program, field nursing consultants of the U. S. Public Health Service, the U. S. Children's Bureau and the American Red Cross have been made available for consultation. One nurse representing the Red Cross and another representing one of the other two agencies have been assigned to each state.

SOCIETY ACTIVITIES

WARNER W. WATKINS, M. D.
Secretary
Arizona State Medical Association

L. B. COHENOUR, M. D.
Secretary
New Mexico Medical Society

LOUIS BRECK, M. D.
Secretary
Southwestern Medical Association

CHAS. F. RENNICK, M. D.
Secretary
El Paso County (Texas) Medical Society

NEW MEXICO MEDICAL SOCIETY

(L. B. Cohenour, Associate Editor)

Chaves County Medical Society held dinner meeting at Nickson Hotel, 7:30 p. m., April 7.

A good attendance was present to hear Dr. A. W. Multhaug of El Paso, Tex., who gave an interesting discussion concerning "The Management of Stones in the Kidney and Ureter." His paper was supplemented by slides.

Drs. R. D. Haire and Earl L. Malone were accepted as members in the society.

E. W. Lander, M. D., Sec.-Treas.

The regular meeting of the McKinley County Medical Society was held on Wednesday evening, April 29, 1942, at St. Mary's Hospital, Gallup, New Mexico.

The members of the Society have notified the New Mexico Department of Health that they will give full cooperation to the immunization campaign which will be started in this community, in the near future. A special meeting was held on April 8, when an outline of procedure was formulated. Lay workers will make a house-to-house canvass of the entire county, to ascertain degree of disease immunity and the need of further inoculations. Instructions will be given each family how to obtain full protection for their children. Inoculations are to be given either by the family physician or by the local Health Department, depending on the financial circumstances of each family. A follow-up check is planned in about three months to determine the degree of cooperation.

It was voted to donate $20.00 to the National Physicians' Committee, to help in their special war-time program.

The secretary read a letter announcing that the annual meeting of the New Mexico Medical Society will be held in Santa Fe, on June 25, 26 and 27, 1942.

A colored film was shown illustrating "Thick, Split, Skin Grafts". Dr. E. A. Campbell then discussed the different methods of skin grafts and their after-care. General discussion of the subject followed.

—W. D. Anthony, M. D., Secretary

EL PASO COUNTY (TEXAS) MEDICAL SOCIETY

(W. John Pangman, Associate Editor)

The staff of Hotel Dieu Sisters' Hospital met Tuesday, May 5.

The Program:

Chronic endocarditis with massive congestion of left lung.—Dr. Jumper.

Discussion.—Dr. Werley.

Congenital atresia of ileum with obstruction. —Dr. Murray.

Discussion.—Dr. Green.

The regular meeting of El Paso County Medical Society, presided over by Dr. F. O. Barrett, president, was held April 27, 1942, in the Tea Room of the Hotel Cortez.

The minutes of the previous meeting and of the Executive Committee were read and approved.

The application of Dr. Shinchi Tokuyama was unanimously disapproved.

A motion picture entitled: "Sex Hormones; Physiology, Diagnosis and Therapy" was presented by Mr. G. V. Edwards and our old friend, Mr. Diamond of Parke, Davis and Co.

Meeting adjourned.

The regular meeting of the El Paso County Medical Society, presided over by Dr. Barrett, president, was held April 13, in the Tea Room of the Hotel Cortez.

The program this week took the form of a round table discussion which was well received by the members of the Society present. The subject "Cholecystic Disease" was opened by Dr. James J. Gorman. The different phases of Cholecystic Disease were then elaborated by Drs. Rheinheimer, Hart and Green. Dr. Dutton discussed the allergic manifestations. When the meeting was thrown open for general discussion the following men took part: Drs. Waite, Hardy, Giere, Felix Miller, Cummins and Majors Mayo and Turnbull.

There was no business transacted. Meeting adjourned at 10 p. m.

Chas. F. Rennick, Secretary.

The regular meeting of El Paso County Medical Society met May 11, to hear this program:

"Symposium on the Management of Shock by Casualty Teams".

The Organization of a Shock Team —Major Wright

Blood Substitutes in Use Today —Major Queen

Surgical Principles in the Treatment of Shock.—Captain Frackelton.

The Recognition and Treatment of Medical Shock.—Major Turnbull.

COMMUNICATIONS

Sir:

Fresh thinking is needed by our profession if we are to meet the demands which the war brings us today and the problems we will face tomorrow. We must no longer be dominated by the notion that medical practice must stay put, with as little change as possible, during and after the war. We must expect and should share in creating whatever changes are necessary to enable us to live up to our obligations in this crisis.

Organized medicine, and I use the term in its broadest sense, has new duties placed before it which it cannot ignore if it wishes to survive. Primarily it must care for the sick both in civilian life and the armed forces, but even beyond this it must help in the present emergency by rehabilitating rejected selectees and war workers, lessening the incidence and severity of illness among the workers in our war production factories and their families, and reorganize and, where necessary, relocate those physicians who are left in civilian practice so that their efforts may be most effective.

Methods for meeting these new responsibilities are not going to materialize out of thin air. They must be worked out by sober study and sane experimentation guided by intelligent thoughtful leaders with the sympathetic understanding of the rank and file of the profession. Smugness and complacency are our worst enemies now. We must not be lulled to sleep by the suggestion that since things have been all right so far they will continue to be all right. Besides I am not so sure that things have been all right up to this point. The fact that we are in the present mess may be related to the fact that

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things have not been all right but we were too dull to realize it.

Our professional journals and the programs of our local, state and national meetings should give much larger space to these matters than they have in the past. We should encourage individuals and minorities to express their ideas, on their feet and in print.

Men must get onto our programs who will stimulate organized medicine into doing some constructive thinking about the future of the profession in this changing economic structure which surrounds us. It is just possible that it is already too late. The immediate future of the practice of medicine in America is much more closely linked to developments of methods for its wide and more equitable distribution than with the development of new techniques, in my opinion, and the sooner thought is given to this aspect of our future, the sooner will organized medicine take its proper place in winning the war and the peace which we all hope will follow.

A friend to whom I made some such remarks recently, replied, "But our Society's program is all made up now, for the rest of the season." Perhaps many programs are. But a surgeon would not hesitate to rearrange his operating schedule to make way for an "emergency ruptured ectopic" and I was not at all sure that the two situations are not really analogous. The real trouble is not that our programs but that our minds are made up. We ought to invite and be proud of a flood of differing ideas printed as articles or letters in our official journals, especially from the young—I should rather say young-minded—men. It is time to stop keeping our programs and our journals free from anything that hasn't been disinfected by our official leaders. There are enough men in our profession who would jolt us into constructive action if we gave them a chance.

Sincerely yours,

Kingsley Roberts, M. D.

Director, Medical Administrative Service

Ed.: This is the new approach of the old Peters-Cabot-Boas-Sizerist "Committee of Physicians", which stirred up all the steam a couple of years back. Remember? However, we are still in favor of free speech.)

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MISCELLANY

"SPEEDING PRODUCTION OF PHYSICIANS"

Under this title, the January 17 issue of the *Journal of the American Medical Association* carries an editorial in which doubt is cast on the wisdom of the shortened schedule adopted by the medical schools of Boston and commented on in the January 29 issue of the *New England Journal of Medicine*. Briefly, the plan provides that the three months heretofore passed in the long summer vacation be eliminated, thus allowing the entrance and the graduation of a class every nine, instead of every twelve, months. After quoting "one leading educator" to the effect that the scheme had not received mature consideration, the editorial goes on to list five difficulties that have arisen. These problems and somewhat different interpretations of them are as follows:

(1) *As an emergency measure, the immediate gain is slight.* The gain may not be great, but it is real and predictable.

(2) *With the elimination of summer vacations, some students will be forced to discontinue their medical education, owing to their inability to earn the necessary funds.*

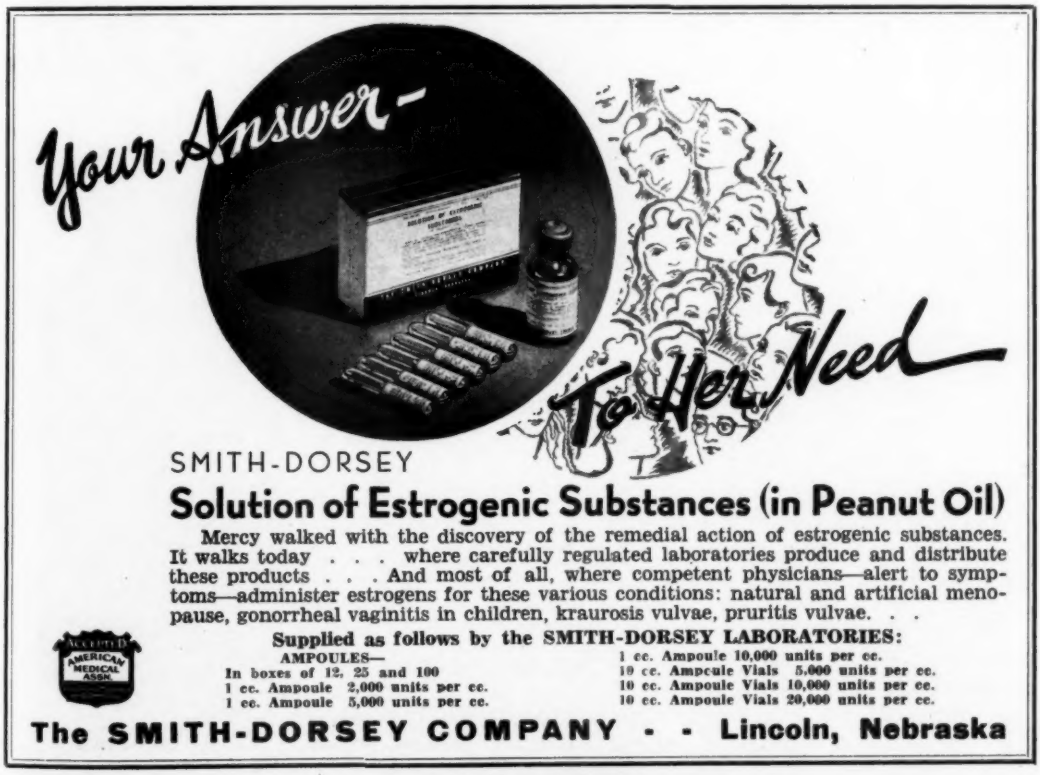
If the Government, particularly in view of its 1942 model of economy, cannot recognize the investment value of a medical student, when physicians are needed so badly, it had better revamp the Selective Service System. Actually, the Government does appreciate the value not only of the medical student but also of the premedical student, and medical schools and colleges could make no better investment than to stake their needy students at a low rate of interest.

(3) *Prescribed R.O.T.C. field training must be discontinued.* If the R.O.T.C. cannot accommodate themselves to anything other than "business as usual," they are overlooking their own interests and responsibilities in the urgency of the moment.

(4) *The technical and teaching staffs must be greatly increased or must devote far more time to their work.* Each medical school must, of course, decide what it is able to do. So far, there has been little, if any, complaint of overwork from the staffs of schools that have adopted the shortened schedule. Furthermore, the medical schools that remain on the old schedule will be a convenience to those college students who cannot complete their premedical requirements until September.

(5) *Unless colleges and hospitals have their curriculums suitable integrated with those of medical schools, the students will lose three to six months waiting for admission as medical students or as interns.* Such a condition has always existed, and there seems to be little necessity of adding another three months each year in the summer.

That professional standards must be lessened is undeniable and inevitable. They have already been lowered by the reduction of internships to one year, and by the renunciation of the somewhat grandiose thought, recently developed, that it takes six or eight years of hospital residence to make a surgeon. To protect the premedical student, it may be necessary to trim medical-school requirements. Physicians with teaching positions will have more work to do, in addition to that already demanded by plans for air-raid protection and civilian defense. Only time can be saved now. Yesterday's leisurely standards must be abandoned. Perhaps



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But neither will glasses cure a disease. We know that at least one-third of all patients who consult an ophthalmologist show evidence of some pathologic condition, either local or general. Many of these persons believe that all that is needed is a good pair of glasses when, as a matter of fact, they require medical treatment. Many persons with incipient glaucoma, chronic uveitis or other pathologic conditions, which might eventually lead to blindness, postpone proper treatment for years because of ignorant or unscrupulous prescribers of glasses. Every person who complains of ocular symptoms, no

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**Laryngoscope, Feb. 1935, Vol. XLV, No. 2, 149-154. Laryngoscope, Jan. 1937, Vol. XLVII, No. 1, 58-60*

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matter how mild they may seem, should have the benefit of a thorough ophthalmologic examination by a doctor of medicine trained in ophthalmology. —*J. M. S. M. S.*

BOOK NOTES

L. O. DUTTON, M. D.
(Book Review Editor)
Mills Bldg., El Paso, Texas

A TEXTBOOK OF INFANT FEEDING FOR STUDENTS AND PRACTITIONERS OF MEDICINE, by Williams McKim Marriott, B.S., M.D. Late Professor of Pediatrics, Washington University School of Medicine; Physician in Chief, St. Louis Children's Hospital, St. Louis. Revised by P. C. Jeans, A.B., M.D. Professor of Pediatrics, College of Medicine, State University of Iowa, Iowa City. C. V. Mosby Co., St. Louis. $5.00.

The third edition of this well-known book covers 475 pages of highly informative material on infant nutrition. The early chapters deal with fundamentals such as growth and development. The different aspects of metabolism in general are discussed clearly and concisely.

Newer information on vitamins and nutritional requirements in infancy are well covered. After this groundwork, the practical feeding of the infant is taken up in detail, not only for the breast-fed infant, but for those that require artificial feeding as well.

A number of chapters are then devoted to the nutritional deficiencies and the effect on the infant body of defects of nutrition of various kinds. Clear and concise ideas are expressed concerning practical management under various circumstances, and the newer knowledge concerning pathological and physiological chemistry as related to nutrition are discussed.

Many case records are given illustrating practical application of the fundamental theories expressed by the authors.

The last chapter on miscellaneous technic contains many valuable suggestions on handling the infant patient, particularly with reference to obtaining speciments for examination, blood transfusions, intraperitoneal injections, and so on.

The book can be recommended without reservation to those interested in feeding children. Not only pediatricians, but the general practitioner should find many helpful suggestions in this field. *L. O. Dutton.*

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IMMUNOLOGY, by Noble Pierce Sherwood, Ph.D., M.D., F.A.C.P., Professor of Bacteriology, University of Kansas, and Pathologist to the Lawrence Memorial Hospital, Lawrence, Kansas. The C. V. Mosby Co., St. Louis. Price $6.50.

This volume, a text of 638 pages designed primarily for medical students, covers the field of immunology quite adequately. The usual fundamentals of infection, host-parasite relationships, inflammation, and so on are discussed in detail. Various types of immunity are explained and illustrated and the major formation, action, and significance of antibodies are discussed.

Laboratory procedures and tests which are based on immunological phenomena are discussed in theoretical and practical detail. The volume can be well recommended as a suitable text in the field as well as furnishing a ready source for the physician who wishes to review modern concepts of these topics.

L. O. Dutton.

PRINCIPLES OF MICROBIOLOGY, by Francis E. Colien, B.S., M.S., Ph.D., F.A.P.H.A. Associate Professor of Bacteriology, and Preventive Medicine in The Creighton University School of Medicine; Lecturer in Public Health and Preventive Medicine, Creighton Memorial, St. Joseph's Hospital School of Nursing, Omaha; Director of Laboratories Health Dept., City of Omaha; Major, Sanitary Division, United States Army Medical Reserve; formerly Professor of Bacteriology and Preventive Medicine in the Central School of Nursing, Milwaukee; and Ethel J. Odegard, R.N., A.B., M.A. Instructor in Sciences Applied to Nursing, College of Saint Teresa, Winona, Minn.; formerly Director of Nursing Education in the Central School of Nursing, Milwaukee; Education Director Miami Valley Hospital School of Nursing, Dayton, Ohio. C. V. Mosby Company, St. Louis, Mo. $3.00.

In this volume the author has covered the field of medical bacteriology rather completely from the viewpoint of instructing student and graduate nurses. Historical and general fundamental aspects of bacteriology are discussed and there is a complete section devoted to the destruction of organisms, with the application of the various factors to practical nursing.

Microbic variation, the bacteriophage, classification of organisms, and infection and immunity, and hypersensitiveness are all discussed.

The latter half of the book is devoted to a discussion of the various pathogenic microorganisms, with their cultural characteristics, staining properties, pathogenicity, epidemiology, and so forth.

Text material seems to be well organized and well illustrated, and on the whole, the book is well done, covering a total of 444 pages.

It is the reviewer's impression that the volume covers more detail than is generally required in schools of nursing. It should serve as

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1942 Session—Santa Fe, New Mexico
June 26-28

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